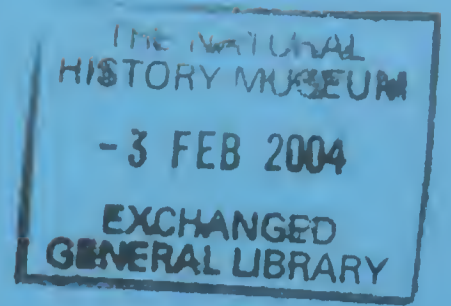


S.416



The Scottish Naturalist

Founded 1871

Volume 115 2003

Part Two

Annual Subscription £35.00

A Journal of Scottish Natural History

THE SCOTTISH NATURALIST

Founded 1871

A Journal of Scottish Natural History

Editorial Committee:

J.A. Gibson

John Hamilton

John C. Smyth

THE SCOTTISH NATURAL HISTORY LIBRARY

Foremount House, Kilbarchan, Renfrewshire PA10 2EZ

The *Scottish Naturalist*, now published by the Scottish Natural History Library, is an independent journal primarily devoted to the study of Scottish natural history. It was founded in 1871 by Dr. F. Buchanan White, of Perthshire, and in 1988 completed one hundred years of publication. For a summary of the record of publication, see the inside back cover.

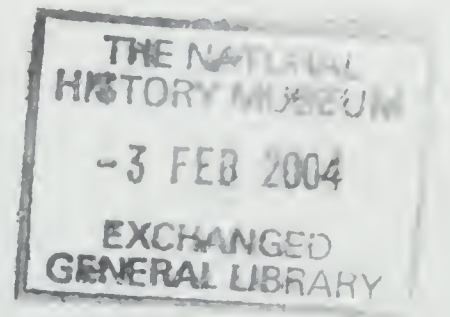
Although the journal's main interests have always centred on the history and distribution of Scottish fauna and flora, it is prepared to publish contributions on the many aspects of Scottish natural science embraced by its title, including Zoology, Botany, Geology, History, Geography, Medicine and the allied sciences, Archaeology, and the Environment.

All papers and notes for publication, or books for review, should be sent to the Editors at the Scottish Natural History Library, Foremount House, Kilbarchan, Renfrewshire PA10 2EZ.

Contributions should be clearly written; whenever possible they should be typed, double-spaced, on one side of the paper, with adequate margins, and should try to conform to the general style and arrangement of papers and notes in the current number of the journal. Maps, diagrams and graphs should be drawn in black ink on white unlined paper. Photographs should be on glossy paper. Proofs of all contributions will be sent to authors and should be returned without delay.

Authors of papers, but not of short notes, will receive thirty reprints in covers free of charge. Additional reprints may be ordered, at cost, when the proofs are returned.

The *Scottish Naturalist* is usually published three times a year. The standard annual subscription is £35.00, which should be sent to the Editors at the Library address. Members of recognised natural history organisations, however, can receive the *Scottish Naturalist* at a greatly reduced subscription; for details apply to the Editors.



THE SCOTTISH NATURALIST

Founded 1871

A Journal of Scottish Natural History

With which is incorporated *The Annals of Scottish Natural History*
and *The Western Naturalist*

115th Year

2003

CONTENTS

2003 - Part 2

Craik Cross Roman Road North-East of Hoscote

By Dr. William Lonie and Mr. Frank Newall

65-91

The Reptiles and Amphibians of the Clyde Area:

A Twenty-Year Update, 1982-2002

By Dr. J.A. Gibson

93-111

Published by The Scottish Natural History Library

EDITORS

J.A. Gibson
John Hamilton
John C. Smyth

All items for publication should be sent to the Editors at
The Scottish Natural History Library
Foremount House, Kilbarchan, Renfrewshire PA10 2EZ

ISSN 0268-3385

The *Scottish Naturalist* is the national journal of Scottish natural history. It was founded in 1871 by Dr. F. Buchanan White, of Perthshire, and in 1988 completed one hundred years of publication. The journal exists to provide a medium for the publication of original work on all aspects of Scottish natural science. All contributions, however, represent the personal opinions of the authors concerned, and do not necessarily reflect the views of the Editors of the *Scottish Naturalist*.

Published by

THE SCOTTISH NATURAL HISTORY LIBRARY

CRAIK CROSS ROMAN ROAD NORTH-EAST OF HOSCOTE

By WILLIAM LONIE and FRANK NEWALL
Renfrewshire Natural History Society

Introduction

The Craik Cross Roman road from Raeburnfoot fort over the Eskdale Fells into the upper valley of the Borthwick Water is well established to Craik village, less certainly to Hoscote (Richmond, 1948). Its course from there to a junction with Dere Street some 30 km to the north-east has been the subject of speculation (Hardie, 1942: 47-48; Margary, 1973: 462-464), and a general route by Esdale Law, Groundistone Height and Harelaw has been suggested. Search-surveys by the contributors along and widely about this route, Route F of the General Map (Newall and Lonie, 1990), variously with Mr. D. Mackinnon, Mr. M. Sinclair and Mrs W.Lonie, commenced in 1981 and continued into 1995. *Discovery and Excavation in Scotland* (DES) contributions outline the survey results to that year (Lonie and Newall, 1996a and 1996b; Lonie, 1996a and 1996b). The Summary below extracts the purely Roman road aspects of the surveys. The seven sectional reports which follow detail the problems of secondary use and erosion encountered. It is to be noted that the summary follows the route from south-west to north-east in logical extension of the known length of the Roman road, while the survey reports read from north-east to south-west, the direction in which the surveys were generally conducted. To do otherwise would rob the report of immediacy for both authors and readers. Survey dates are indicated lest there be seasonal or land use changes, and to facilitate location in personal journals.

Summary: Roman Road traces from Milsington to Harelaw (17 kilometres)

The route from Craik village by Hoscote and Milsington remains to be traced, but the Roman crossing of the Borthwickbrae Burn is at NT34621301. The Roman nature of the crossing is evidenced by a 10 m length of stony road-mound set across the burn bed, and cut through by the burn and a tributary stream at that point. Both approaches to the crossing are on mounded terraces 7.0 m wide. The road-mound sections exposed by bank erosion are of clay and stones, c.4.0 m wide and 0.5 m thick, set directly on the sub-soil, i.e. without a laid stone roadbed.

North-eastwards on-line across Borthwickbrae and Greenbank lands, the Roman road structure is much reduced by cultivation and elsewhere overlaid by

farm tracks. At NT41531393 a much disturbed but apparently unstructured stony cairn, 22 m in diameter and 1.7 m high, stands just off the road-line on locally high ground in line-of-sight of Craik Summit (Lonie, 1996b). This feature is adjudged to be a funerary cairn, not a Roman signal station base.

The crossing of the Howcleuch Burn at NT41801423 is drowned in a late-19th century millpond. Both approaches are broad embanked ways some 11.0 m wide, narrowing at the water's edge to 5.5 m wide road-cuttings, sloping down to the presumed ford, deeply drowned. These approach structures have been much modified by later road- and estate-works. At NT41871446 a recently re-cut ditch exposes a scatter of large stones for 5.0 m uniquely across the road-line. A Roman culvert may be thus revealed.

For some 2.0 km north-north-east trending north-east from this point, the Roman road-line is marked by a mounded terrace, 10 to 12 m wide, much eroded in places. A tarmac minor road twines with this terrace for most of that length, running at first to the east, then to the west of the Roman road. The route is imposed by the local topography of wet-lands and steep side-slopes. For the 600 m of final approach to the crossing of the head of the Black Syke at NT43111591 the Roman road runs clear on the east rig of Hangingshaw Hill as a 4.0 m wide road-mound on a terrace or a cleared roadway up to 12 m wide. At NT43031582 a string of three or four quarry-pits along a rocky out-crop are appropriately adjacent to a 100 m length of road-mound over wet ground.

The crossing of the head of the Black Syke was in a cleared-way through deep peat, now slumped to 4.0 m wide hollows at each end. There is a probable upcast of road-mound material on line at a recently cut field-drain. North-east from the head of the Syke, the road rises on a 9.0 m wide mounded terrace cranked to break the steep slope on to Borthwickshiel Horn. On the Horn a 6.0 m wide broken road-mound and a shallow 10 m terrace mark the road. The saddle between the Horn and Kemp's Castle hill at NT43721639 appears to have been ramped to lessen gradients at each end. The road terrace, still 10m wide, traverses the south-east slope of the Castle hill then runs as a faint wide clear-way on the gentle slope to the Blawearie gap at NT44161667, just east of the junction of minor tarmac roads there.

From Blawearie the road runs north-north-east trending north-east to skirt the heads of the Blind Burn as a 10 m wide mounded terrace. The road is then buried under deep peat for some 200 m on the approach to Gawndie's Knowe, but was located by probing and by bends in recent drainage ditches. The road emerges at NT44471700 as a broad clearway. A terrace slumped to 7.0 m wide carries the

road over the Knowe, skirting south-east of the summit at NT44631710. Quarry scrapes, rather than pits, above the terrace descending to the north-east, confirm the road-building activity. This terrace leads on to a road-mound set on a 10m clearway or shallow terrace that may be traced for some 1.3 km along the low but generally dry ridge between the Threepwood Moss and the wet ground of the upper Woo Burn to the Woo Burn fords at NT45951772. A recent deep drain cuts the road-line at NT45111736 to show a road-mound section, 3.0 m wide by 0.3 m thick, of clay and stones set directly on the sub-soil without obvious roadbed, kerbs or roadway side-ditches.

The multiple fords of the Woo Burn have had much post-Roman use by all of cart-, carriage- and drove-ways, so that the stony bases and scattered bank stones are difficult to attribute. The Roman crossing is the most northerly. A few large stones and the low approaches suggest it was culverted. From this ford the Roman road rises east for 800 m as a broad centre-mounded clearway to the ridge running north-east to Cockplay hill-end. On the ridge a clear terrace, 10 to 12 m wide, carries the Roman and later roads. Near Cockplay the ridge has been slighted by cross-ditches to prevent its continued use as a through road by vehicles. From Cockplay, north-east for 2.7 km to the present A7(T), the Roman road-line is marked by frequent traces of a terraced and embanked road which fords the Long Moss Burn at NT47971896, skirts to the south-east of Hall Moss, and descends to the A7(T) at NT49572024 on Groundistone Height. On the descent, old field-walls variously acknowledge or ignore the Roman road-mound.

From the A7(T) a broken embankment over wet ground carries the Roman road north-east to a crossing of the Dearly Burn at NT49742032, where a section in the burn bank shows a stony roadbed set on a broad swell of clay and small stones. Appropriate to the wet passage there are several quarry-pits some 50 m off the road-line along the hill-slope about NT49732037. North-east from the Dearly Burn, the faint broad terrace of the Roman road rises and runs under the enclosed Drove Road of the Ordnance Survey (OS) maps at NT49962046.

The Drove Road is enclosed variously by dry-stone walls and turf banks, some of the latter surmounted by hedges. The enclosed way is shared with a cart-way hollow and, in part length, with a dry-metalled carriageway, all now disused. From under this complex the Roman road structure protrudes intermittently as a low terrace shoulder, notably on the north-west side along the 600 m length between NT49962045 and NT50372086, and finally as a broad embankment over wet ground at NT52042211. The continuation of the Roman sub-structure along the ridge-way for a further kilometre towards Harelaw seems probable, but beyond the point noted the Roman road structure has not revealed itself.

Craik Cross Roman Road Survey

Sectional Reports

(1) Harelaw by Bewlie Moor and Black Craig to Groundistone Height NT534231 to NT496202. Figure 1(c).

August 1981. From Harelaw, NT53382310, the access road for 300 m south-west to the gate to the Drove Road of the OS maps is recent and dry-metalled with graded quarry-stone. For some 900 m to Drove Road Plantation the drove-way is heavily over-grown with bushes, but is clear south-west from there. The drove-way is generally 12 m wide over turf side-banks, slumped 1.7 m wide and 0.4 m high, but occasionally expands on the north-west side to 14.5 m wide. Along the plantation edge the north-west side-bank is planted with hawthorn and beech, and to that side the road surface shows much fist-sized river-stone (c.10 cm grade), particularly on the slopes of the undulations about NT52162223. This scatter of stones, off-centre of the drove-way, may be a Roman roadbed, but is more probably the metal of the secondary road noted below. Otherwise the way is of earth, much churned by cattle where not grass-grown.

November 1984. At NT52042211 a sharply-scarped embankment 1.0 m high carries a metalled road, 3.5 m wide, over marshy ground. This road build is clearly secondary to the broad low mound which protrudes from beneath it, with a shoulder some 3.0 m to the north-west side of the driveway, in the open ground beyond the wire fence here. At NT52002206, just south-west of the wet ground, the primary road mound is 11 m wide, with the secondary road, now a worn-down hollow-way some 6.0 m wide, along its south-east edge. A droving bank flanks the secondary road on its south-east side. At NT51862194 the drove-way is centrally metalled and reduced to 6.4 m in internal width, from a norm of 8.5 m, by droving banks on both sides which obscure the original terrace width. Some 200 m south-west, at NT51722187, the primary roadway expands on its south-east side, to 8.2 m, with the secondary road still bounded on its north-west side by the bank which runs on that shoulder of the early roadway. At this point the metalled secondary road diverges south-south-west to an enclosure on Chapel Moor, as on the OS map of 1896, and presumably to a chapel there.

At NT50862127, a point typical of the 1.0 km straight south-west to Black Craig, the drove-way is 7.6 m wide between its banks. The general slight camber is broken along the north-west side by a cart-way hollow. Beyond the droving-banks, the shoulders of the early roadway extend equally on each side to 14.3 m overall. From the west corner of Blackcraig Plantation, NT50372087, for some

600 m south-west to NT49962045, the shoulder of the early terrace shows intermittently along the north-west side of the enclosed drove-way. Along this same length the cart-way in its hollow runs sinuously on the primary terrace, generally to the north-west side but in two places crossing it. The cart-way is clearly over-laid by the droving-bank.

As elsewhere along the route, the sequence of broad terrace- or mounded-way / cart-way / enclosed drove-way is established. It is to be noted that drove roads so designated on the OS maps often lead through farmland and urban areas to stockyards at railheads, and their enclosure may be a product of the Railway Age of the 19th century. The cart-way need not predate any open drove-way on the route before enclosure, but was out of use at the time of enclosure. The putative passage of kings, prelates and great canon in the high medieval period has left remarkably little trace.

At NT49962046 the enclosed drove-way and the cart-way curve from south-west to south-south-west downhill, cranked to reduce the gradient. An enclosed drove-way can be traced towards Hawick town: it runs clear for some 300 m parallel to the A7(T) on its west side about NT50101955. At the first downhill curve, a broad shallow terrace emerges from under the drove-way to continue south-west, fading on the lessening down-slope to the head of the Dearly Burn at NT49742032. The ground on the east bank of the burn, on-line with the terrace, mounds slightly. The section in the burn bank shows a broad swell of clay admixed with small stones, capped with larger stones. About NT49732037, along the hill-slope some 50 m to the north-north-west, is a series of small quarry-pits, appropriate to the wet passage. South-west from the burn crossing, a short cambered length runs on-line in otherwise very broken ground and marks the way to the A7(T) trunk road over Groundistone Height at NT49572024. On-line immediately beyond the A7, the broad cambered way of the Roman road rises on the ridge towards Hall Moss.

The Dearly Burn road section seems atypical of a Roman road section in its heavy stone capping. The explanation is probably that the stony layer is a Roman roadbed on a Roman embankment over the wet ground, and that the original Roman agger has been worn down by later traffic. The roadbed may have been strengthened to carry medieval traffic over the wet ground. The major medieval road which followed the same general line has tended to be ignored in concentrating on the specifically Roman road traces. It may be doubted if the medieval road crossed the Dearly Burn at this point. The Dearly Burn road section exposure, with the broad terrace and cambered lengths on line, and the

adjacent quarry-pits, are strong evidence for the Roman nature of the road-mound and terrace underlying the Drove Road from Harelaw.

**(2) Groundistone Height by Cockplay to the Woo Burn
NT495202 to NT460178. Figure 1 (c), Figure 1 (b).**

The account of this road length is compiled from search-surveys made in May and July 1981, November 1984 and February 1995, variously by F. Newall and W. Lonie, with D. Mackinnon and M. Sinclair.

The Roman road traced from Harelaw to Groundistone Height (Lonie and Newall, 1996a) crosses the A7(T) main road at NT49572024 to continue south-west as a broad cambered way followed by recent tractor tracks. On the rise to Groundistone Covert the cambered Roman roadway is crossed over by the stone and slumped turf dikes of old enclosures, probably of 18th or 19th century date, and is broken by drainage runnels and field tracks serving these enclosures. Beyond the enclosures, at NT49121994, the road-mound bends south-south-west in order to skirt south-east of the wetland of Hall Moss. At NT49001974 a dry-stone wall is gapped to pass a field-track following the cambered way. The gap is obviously narrower than the spread mound of the Roman road.

Some 70 m further on, at NT48951969, the Roman road-mound passes under the enclosing banks of a drove-way running north-west to south-east. On-line about this point the north-west shoulder of the Roman road terrace is clear, and south-west beyond the drove-way a broken linear mound marks the road until it enters Groundistone Covert at NT48861952. The road emerges from the Covert 150 m further on, at NT48791939. South-west from the Covert, at NT48701926, the Roman roadway again runs for a short length as a clear terrace, 12.8 m wide. Some 200 m south-west of the Covert, at NT48671923, the Roman road swings to a west-south-west course, on the same line as an enclosed drove-way and attendant cart-way, emerging from the Covert at NT48901936. This drove-way, in either open or enclosed forms, and the cart-way follow the Roman road-line south-west for the rest of the 3.0 km distance south-west to the fords of the Woo Burn.

Only on re-editing these notes was it realised that this convergent driving lane and its attendant cart-way is near-exactly aligned with the foot of the cranked descent of the drove- and cart-ways from NT49962046 on the Black Craig ridge noted above. It seems probable that both drove-way and cart-way elements are continuous across the Groundistone Height gap, on a line separate from that of the Roman road. This alignment existed prior to the making of the A7 precursor road

from Selkirk to Hawick. The latter was re-aligned as the A7(T) over the Height in the late 20th century, finally obliterating any old cross-roads.

The one-inch OS map of 1858/59 shows the A7 precursor and also an unenclosed road crossing the Groundistone ridge some 1.7 km to the south-east. The latter is referred to below as a coach-road, but of course it would have carried more general traffic in the high horse-transport era. Disjointed lengths of this road are shown on the 4.0 cm Ordnance Survey map of 1987. An enclosed drove-way descends from Groundistone Height to Hawick, as noted in the previous section.

The continuity of the drove- and cart-ways along the Groundistone ridge, but off the Roman line, has implications for the Roman use of the agger at the Dearly Burn crossing. With the drove- and cart-ways definitely off-line, the wear exposing the roadbed becomes more probably Roman and a token of heavy Roman traffic on the road. However, the nearby quarry-pits are plausibly from the primary construction of the road rather than from later repair. Elsewhere on this road, at Jubilee Woods and the Borthwickbrae Burn, where agger sections are revealed apparently undisturbed by secondary use, the structure lacks any substantial stone roadbed and the agger appears largely intact, to judge by remaining height and spread. There are no obvious signs of repair or rebuild. The width of the terrace, cleared- or mounded-way, upon which the agger is set is frequently noted to be upwards of 10 m.

Such a robust roadway on a minor upland Roman road we have come to associate with the Flavian period of occupation (Lonie and Newall, in preparation). However, Raeburnfoot Roman fort, in White Eskdale at the south-west terminus of the Craik Cross road, is reported to be of Antonine date (Robertson, 1962). The question of the period and weight of Roman usage of this road is not trivial in Romano-British historical terms. The authors consider a 1st century dating to be appropriate, and would suggest the Roman use of the road to be mainly in the conquest and subjugation phase of the occupation.

The old coach-way from Selkirk to Hawick crosses the Groundistone ridge from north to south. It is clearly later than the Roman road-mound over which it rides at NT48461913. The coach-road, 7.3 m wide, nicely dry-metalled, slightly cambered and sunken, is now disused and grass-grown. For 500 m west-south-west from this road crossing to the Long Moss Burn at NT47971896 the cart-way and recent tractor tracks are sinuous over the marshy ground, but a line of rushes and low banks alongside these features suggest an earlier straight way, confirmed at NT48331907 where a short length of Roman road-mound, 6.4 m wide, runs on line.

From the east side of the Long Moss Burn ford at NT47961895 an isolated length of dry-stone wall runs off north, its purpose probably to control droving (Lonie, 1996a). The east approach and the ford itself are stony but otherwise unstructured. The south-west approach is steep and deeply hollowed by the cart-way. Any earlier road structure is obliterated. The road bends to the south-west at the ford, and a 16 m wide band of droving trample down to a stony clay surface, sparsely grass-grown, rises for 500 m to Cockplay, NT47581862. On this droving band runs a low cambered way up to 11 m wide, with the cart-way hollow to its south-east side. This 500 m length follows the shire boundary between Selkirkshire and Roxburghshire but elsewhere there is no coincidence. On Cockplay head the road complex bends south-south-west along the ridge.

For 300 m to NT47491836 the Cockplay ridge crest is typically only 10 m wide, and shows no obvious signs of regular traffic use. On this length any ridge-way road was slighted by several transverse ditches, some 2.0 m wide and 0.5 m deep. Unusually for such ridge-way barriers in the Borders uplands, these ditches are without up-cast banks. Presumably, but not obviously, spoil was thrown down-slope of the ditch ends.

The purpose of the unbanked ditches was probably to inhibit vehicle traffic but still to allow droving with minimal risk to the animals. The ridge crest is appropriately grown with grass rather than heather. The disposal of the spoil may suggest that vehicle use was not easily deterred, the means to re-fill the ditches being carefully removed. Proprietorial wishes, travelling people, and fiscal avoidance variously come to mind. Sparse stones exposed in the ditch sides by recent tractor use confirm the absence of any heavily made road, such as is found further south-west on the ridge, but may represent a Roman roadbed. On firm subsoil, as here, the roadbed of a minor Roman road is often a very slight, almost token, structure.

At NT47491836 the ridge-way bends south-west on to the main ridge towards Woo Law and is joined from the east by a well-made carriage-road rising from Hawick town. The slighting of the Cockplay ridge route probably dates from the making of this road, possibly in the early 19th century. For 900 m south-west along the Woo Law ridge, the carriage-road, the drove-way and the cart-way run on an earlier broad terrace. The terrace is 10 m to 12 m wide, ditched to its rear, and roundly scarped and eroded in several places on its south-east, down-slope, side. This broad terrace may confidently be identified as Roman in origin. At NT46781776 the ridge-ways are joined by a Drove Road, so marked on the OS maps, and another well-made carriage-road on the same route, both rising from the south-east and Hawick.

From this point only a narrow cart track continues south-west, contouring sinuously along the steep and broken south-east slope of Woo Law. In about one km and just beyond Woo Law, this cart track passes near the Cheese Well (spring) marked at NT46291710 and turns to run due west for 1.4 km to rejoin the main skein of roads near Gawndie's Knowe and the head of Harehope Sike. A cart track in the Sike gully leads north-north-east into the Ale Water valley. A cairn at NT45361714 and a droving sign-wall at NT45171723 suggest traffic in both animals and cheese from the Ale Water valley to Hawick, 9.0 km distant in Teviotdale. There is another Cheese Well near the summit of the Minch Moor road. Wet cloth may have been draped habitually over pony panniers to cool cheeses in transit.

From the Woo Law ridge the combined carriage-roads run down-slope due west to the Woo Burn on a well-graded terrace, 5.0 m wide, sharply scarped to front and rear, to the upstream of two well-made stony fords 27 m apart about NT46001773. Some 100 m north of this terrace, the combined drove-ways similarly run due west down-slope, at a gradient of 1:20, as a 10 to 15 m wide clear-way through the deep peat and heather cover, to a broad but unmade ford of the burn at NT46031775, marked by the grass blaze of droving use in the sparse heather on both low banks. Near the foot of the clear-way two cart-ways turn from it to the south and curve in separate hollows to the more downstream of the two stony fords noted above.

The droving clearway has a broken central mound of clay and stones, topped with peat under heather along much of its length. Such a structure was standard Roman practice on high peat-covered ground. The erosion to ground level on both sides of the central mound may reasonably be attributed to droving-trample and to cart-way hollows following the sides of the Roman agger on a broad clear-way. At the drove-way ford a scatter of large and small stones, uniquely on the line of the agger, suggests the Roman crossing to have been on a culvert broken by subsequent droving traffic.

Elsewhere in the Borders uplands 'dual cart-ways' have been noted, specifically on the 900 m long, 1:8 rise, from Kirkhope Tower to Witchie Knowe between Ettrick and Yarrow, and on the rise from the Bowmont Water valley to The Street (not structurally Roman), over the Cheviot water-shed (Lonie, 1989). A 1:8 maximum gradient is commonly adopted on cart tracks in the Border uplands and may identify such tracks as for carts rather than pack animals. The 1:5 gradient on one section of the dual road out of the Bowmont Water valley, clearly a wagon-way, suggests trace-horse working, again as elsewhere in the Border hills.

**(3) Woo Burn fords by Gawndie's Knowe to Blawearie
NT460178 to NT442167. Figure 1(b).**

The account of this road-length is compiled from search-surveys in May and July 1981, and two in February 1995, variously by the contributors with D. Mackinnon and Mrs W. Lonie. Several alternative routes were searched and much was learned of roads and tracks of periods other than Roman.

For some 50 m north-south about NT45951772 the Woo Burn cuts through a morainic bank of large stones in clay, which offers dry approaches to a fording point in the otherwise wide wetland and peat bog of the 3.0 km length of the upper burn valley. The Roman road traced to the ford from the north-east shares the crossing with tracks, roads and drove-ways of later periods (Lonie and Newall, 1996a and 1996b). This same skein of roads west of the ford proved difficult to unravel.

The Threep Moss Burn enters the Woo Burn from the south-west at NT46081790, some 200 m north of the fords, so that ways making towards the ridge of Threep Head and Esdale Law must cross this minor burn. There are no fewer than three fords and a timber bridge crossing of the Threep Moss Burn, each with its own approach from the east and rising terrace to the west. The realisation that none of these structures had Roman characteristics returned attention to the broad rise between the burns west-south-west towards Jubilee Woods plantation.

At NT45901771, some 150 m west of the Woo Burn fords, a level clear-way of stony clay under sparse grass separates from the complex of roads. The clear-way is 7.2 m wide in the shallow peat and coarse grass of the ridge, and curves to west-south-west for 500 m up the ridge to the plantation gate at NT45501762. From the gate a 15 m wide break south-west for 450 m through the plantation appears to mark a recognised drove-way. The 7.2 m clear-way was accepted as part of that drove-way in the earlier surveys. In the re-survey prompted by the Threep Moss Burn findings, it was realised that on the slight northerly side-slope higher on the ridge the clear-way ran on a wider shallow terrace with vestigial ditches, some 10 m overall. Also noted was that within the plantation a dry grass blaze, characteristic of a drove-way, diverged slowly northwards from the plantation break. The density of tree growth prevented the blaze from being followed, but the line was noted in the hope that it marked the Roman roadway underlying the drove-way.

On the projection of this line west-south-west through the plantation, at NT45111736, a main ditch recently cut along the woodland edge showed

unusually heavy clay upcast at that point, and revealed a clear road section of Roman character. Overlying peat growth up to 0.3 m deep showed the road-way cleared 7.2 m wide, without obvious side-ditches. The agger is of stiff clay, 3.0 m wide and 0.3 m deep, set directly on the sub-soil, without obvious stony road-bed. The surface traces of this centre-mounded clear-way are parallel bands of grass blaze and heather for some 350 m west-south-west to the foot of Gawndie's Knowe at NT44821722. The road then rises as a slumped terrace, 7.0 m wide, to the south-east of the summit at NT44671710. Quarry-scrapes, rather than pits, above the terrace confirm the road-making activity. There are no built structures on the 325 m high vantage point of the Knowe. A small stone-quarry on the road-line is probably associated with dry-stone walls nearby.

Gawndie's Knowe is the focus of several cart-ways and drove-ways in addition to the Roman road. On the slope south-west of the summit the Roman terrace, 7.0 m wide, is joined at NT44601709 by a cart-way from the north emerging from Harehope Sike. This is probably one of the cart-ways that diverged at the Woo Burn ford and may be that used on medieval royal progresses from Roxburgh to Whithorn. The cart-way from the Cheese Well and Hawick into the Ale Water valley was noted above. A third, probably from Whitslade Tower and farm in the Ale valley, runs south towards Harden House. En route, this last track passes another droving guide-wall at NT44801694, whose purpose was to warn of the morass of the Blind Burn head.

From Gawndie's Knowe the Roman road and its attendant cart-way descend to NT44471700, where a broad clear-way on line disappears under peat and heather overgrowth. The line thus established was followed south-west over heavy heather growth and deep peat on the gentle south-east side-slope under Esdale Law, largely by back-sighting. This procedure was rewarded some 150 m further on, at NT44351691, by finding recent small land-drains stopping against or diverting to cross a hidden linear obstacle. Probing encountered a mounded hard surface at several points on line, 4.0 to 6.0 m wide under c. 0.5 m of peat. The Roman road is under this peat cover for some 300 m to NT44241682 where it re-appears as a broken terrace, 7.0 m wide, with a cart-way hollow to its back. This terrace bends slightly to run south-south-west for 200 m to NT44161667, where it is obliterated by a major land-drain and the Harden access road opposite Blawearie Cottage, formerly Harden Cottage.

In the passage from Gawndie's Knowe to Blawearie, both Roman road and medieval cart-way are completely hidden by mature peat some 0.5 m deep. While this was to be expected of the Roman road across the slack contours of the Blind Burn head, the disappearance of the cart-way under peat of the same depth gives

pause for thought. In the peat overgrowth we appear to have material evidence that the cart-way was abandoned in more nearly Roman times than 'medieval' or 'recent'. From the 1800 years between 200 and 2000 AD we might select c. 1000 AD. This is near the end of the kingdom of Northumbria under the onslaught of Scots and Vikings. Viking raids caused Lindisfarne abbey and see to be abandoned in 875 AD, and the Norse took Galloway, including Whithorn, about 920 AD. The old Roman road would plausibly have found use in a Northumbrian context in the 8th and 9th centuries, and would have been abandoned in the 10th century.

The slight structure of the Roman road merits comment. Despite the classical road-building regulations so often quoted, the Romans in the military zone made their roads of immediately available materials to functional standards (Chevallier, 1976). An important function of the Roman road in the military zone was to carry despatch-riders and cavalry patrols. The road-mound crest, with an earth or gravel surface kind to un-shod hooves, resilient, well-graded, dry in all weathers and clear in light drifting snow, would be ideal for riders without stirrups at the canter or gallop. For this purpose the slight road structure often found would be quite adequate. This conclusion does not vitiate other means of telecommunication, such as semaphore and signal fire. The Roman army was ever inclined to 'belt and braces'. The perfunctory aggers of these roads would be quite inadequate for wagon traffic. While the paved Roman roads, such as Wade's Causeway from Maldon to Whitby, were designed for wagons, their structure and rarity emphasise that pack animals were the rule for goods transport in the military zone.

(4) Blawearie over Borthwickshiel Horn to Hangingshaw Hill

NT442167 to NT426156. Figure 1(b), Figure 1(a).

Search-survey in April 1995 traced the Craik Cross Roman road over the 1.9 km from Blawearie to Hangingshaw Hill. This road-length was not easily traced. Several possible alternative routes, particularly over Borthwickshiels and the Glenburn lands, proved negative. In previous search-surveys the road-line had been traced to the termini noted (Lonie, 1996b) and it was gratifying to find continuity.

For 50 m south-west from NT44161667, east of Blawearie Cottage, field-drains and the junction of tarmac roads there obliterate the Roman road. From the hunt gate on line the Roman road climbs the gentle slope of Kemp's Castle for some 200 m south-west, at first as a faint broad depression overgrown with heather, and then, on the steeper side-slope about NT44041658, as a shallow terrace, 10 m wide. At NT43931648 this terrace is cut and banked diagonally through a natural scarp along the hill slope. On the natural terrace above the scarp the roadway

bends to west-south-west and converges with a tractor-track on a cart-way rising from the east from Harden. At NT43861645 the road terrace is cut and banked through a second natural scarp, and runs at first as a shallow terrace and then as a broad cambered straight for 150 m west-south-west to NT43721639. There the roadway descends abruptly, on a 20% down-slope for 25 m, to the narrow saddle, some 50 m long, leading south-west to a similarly steep rise on to Borthwickshiels Horn. Although the ends of this ridge-way appear to have been embanked to reduce the gradients, this passage must have presented problems for horse-drawn vehicles.

At the south-west end of this ridge the early and the late roads diverge, the tractor- and cart-ways to run south-west along the wood edge, and the Roman road to continue as a broad clearway west-south-west up the spur to the crest of the Horn. The spur has been graded and levelled, with some rock-cutting, to accommodate the clearway. On the crest, at NT43621634, two minor dyke-stone quarries lie across the road-line, but road-sections are obscured by quarry-edge disturbance. Beyond the quarries the Roman roadway runs 100 m west-south-west as a terrace, 10 m wide, along the north-west brow of the Horn to NT43531628. There the road bends to the south-west and shows as a road-mound 6.0 m wide, grass-grown and much broken by cattle-trample. This road-mound runs gently downhill for some 100 m to NT43461622, where it is lost in an area of old cultivation rigs some 100x100 m in extent on a sloping terrace.

En route, widely scattered about NT435163, twelve or more small conical pits are probably aerial bomb craters of second World War vintage, although a brief search failed to find any bomb fragments in the grass overgrowth. A broad blaze of grass in the general heather cover uphill of the road-mound suggests a drove-way along the Horn ridge. A concern that the 'road-mound' might be a much-reduced turf dyke de-limiting the drove-way was dispelled by finding an old turf dyke of quite different character, much narrower and more upstanding, on the crest of the Horn. This dyke separates the drove-way from sometime cultivated ground to the south-east. The dyke is divergent from the road-mound, a further indication that the two features are unrelated.

The Roman road is re-discovered some 130 m to the west at NT43331619, from where it runs gently downhill south-south-west for 200 m to NT43231600 as a low mound 5.5 m wide. A slumped turf dyke, 2.0 m wide and 0.5m high, parallels the road-mound on its west side, along the edge of the ridge. Ditch hollows to front, back and between these features extend the road-terrace width to 9.0 m. This terrace forms the west boundary of the rigged area for the first 100 m of descent, but not on the lower slope. The offset of the two lengths of road-

mound is due to an open zigzag break of slope. Field rigs and a turf dyke parallel to the missing traverse obscure the early road structure.

At the lower end of the terrace, NT43231600, the mounded way diverges slightly east from the turf dyke to avoid a small rock bluff, and runs out as a cambered way, 10 m wide, truncated at its lower end by the terrace of a cart track, recently re-made, which crosses north-west to south-east at NT43231590. An alternative final descent, of lower gradient, is by a major hollow-way, 11 m wide by 1.0 m deep, which curves first south-east then south-west to NT43241589.

The route of the old cart-way, presumed medieval, separate from the Roman road along the Horn, was not sought. It was gratifying to find that the field-notes recorded the separation and rejoining of the two ways at points of increasing gradient. The observation suggests that Roman traffic on the Craik Cross road was limited to horse and foot, while the cart or wagon traffic on the medieval track was of loads heavy enough to require some regard for gradient.

From the foot of the Horn the route for 200 m due west lies across the head of the aptly named Black Sike. In line with the hollow- and Roman road-way descents from the Horn, a 4.0 m wide cutting, grass-grown, runs some 20 m into the 0.5 m deep peat of the Sike at this point. On line further west this peat is much broken by cattle-trample, erosion and field-drains. A recently cut drain crossing the line of the roads at NT43111591 shows two patches of broken stone in the clay upcast. At the wider of these, c.3.0 m wide, the clay exposed beneath the peat is banded, lighter to the top, for some 5.0 m. This is probably a road-mound disturbance. There was an active cattle-station only 50 m south of the route and inquisitive bees hampered survey. Some 50 m west of the drain disturbance a deep cart-way hollow, prudently observed only at a distance, rises on a terrace for some 100 m on the north side-slope to the crest of the natural scarp at NT43041587. There, out of sight of the cattle, the mounded-way of the Roman road was re-discovered.

From this brow overlooking the Black Sike, the Roman road-mound, slumped to 10 m wide and some 0.2 m high, with the cart-way hollow 1.5 m wide edging its north-west side, runs straight south-west for 200 m over level, marshy pasture. Broad cultivation rigs, much overgrown, here clearly cut across both the Roman road and the cart-way. Some 50 m south-east of the road-line, on the outcrop ridge about NT43031582, are three or four shallow quarry-pits 3.0 to 4.0 m wide, grass overgrown. As Roman features these quarry-pits are quite appropriate to the flat, wet terrain. At NT42871572 the roadway curves west round a rocky boss and then resumes its south-west course to the edge of a recent plantation at NT42721567.

South-west for 100 m within the plantation the Roman agger stands high, 6.0 m wide with the cart-way hollow to its north-west upslope side. Recent access gates ignore the cart-way hollow and align with the south-east side of the agger. South-west beyond the plantation the Roman roadway shows as a low, broad cambered way for 100 m over improved pasture to NT42561555. Here the Roman road-mound is truncated by the terrace of the tarmac road in present use, which runs briefly east to west at this point. On line beyond lies the Roman roadway along the south-east foot of Hangingshaw Hill way traced in previous search-survey.

**(5) Hangingshaw Hill foot by Borthwickshiels Loch to the Howcleuch Burn
NT425155 to NT419144. Figure 1(a).**

The Roman road-line traced to NT42561555 as above (Lonie, 1996b) emerges below the terrace of the minor tarmac road there as a cambered way, 10 m broad, between shallow ditches which descends south-west at a moderate gradient to the wet ground about NT42481546 at the head of the Borthwickshiels Loch Burn. On the descent the road-mound is cut across from south to north by the grass-grown embanked terrace of a cart-way from Borthwickshiels House rising to the tarmac road. For some 30 m across the wet ground the cambered road structure is lost, perhaps washed out, but re-emerges at NT42461543 to run for 350 m south-west to NT42261522 as a mounded terrace, generally 10 to 12 m wide, broken in places. A cart-way hollow runs to the north-west upslope side of the Roman road. The Roman roadway continues south-west for 100 m from the end of the terrace over flat ground as a low broken mound 12 m wide to NT42211516, where it passes under the access road to the Regional water-works.

On emerging from under the access road, the Roman road shows as a low central mound on a 15 m wide natural terrace between low out-crop stone dykes for 250 m south-west to NT42001493. There the Roman road structure is cut across north to south and is overridden by the tarmac roadway which bends and runs south for some 50 m to negotiate the rock outcrops noted above. Concern that the natural terrace might be simulating Roman road remains was dispelled after some search. At this point the tarmac road bends again, from south to south-south-west and the Roman road bends from south-west to south-south-west. The Roman roadway reappears in part-width, protruding some 5.0 m on the western, now down-slope, side of the tarmac roadway for some 200 m to NT41941472. There the two roads coalesce fully and run together for 200 m south-south-west to NT41911453.

At first sight the combined roads then seemed to bend together to run south-south-east for 300 m to Howcleuchsheil farm, with a final steep zig-zag descent to

the present bridge and old bridge remains over the Howcleuch Burn at NT42121422. This un-Roman behaviour was explained by search upstream in the Howcleuch Burn bed to the projected line of the south-south-west run of the roads. There a convincingly Roman crossing and approaches were found (Lonie, 1996b).

Cultivation, though not now obvious in rough pasture, has obliterated any significant trace of the Roman road-terrace and mound for some 150 m along the western side the tarmac road, and on-line south-south-west beyond to NT41901452. There, elongated on-line, is an isolated 15 m length of road-mound, 9.0 m wide, with cart-ways to both sides. Some 50 m further on, at NT41891447, is a short length of unusually heavy road-mound, 4.5 m wide and 1.2 m high, again elongated on-line. Cart-way hollows on both sides of this mound are 4.5 m wide to the east and 2.7 m wide to the west. These mounded features lie within a field enclosure. The heavier mound has clearly been built up by some activity that has slighted the early road. Stone clearance may be suggested though no stones show on the grass-grown surface of the mound. The slighting may have been occasioned by the building of either the old bridge, possibly 16th century, or the mill-dam noted below, probably 19th century. Fifteen metres south-south-west of the heavier mound, at NT41871446, a recent small drainage ditch runs north-west to south-east and exposes large stones in a scatter, 2.0 m wide by 5.0 m long, uniquely across the road-line. A Roman road-bed or culvert appears to have been disturbed by the ditch-work. Here and south-south-west for some 40 m the road mound has been washed or dug out, and at NT41861443 the road-line is cut through by large drains. The final approach to and crossing of the Howcleuch Burn is described below.

**(6) Over the Howcleuch Burn and by Borthwickbrae
NT419144 to NT413137. Figure 1(a).**

Previous survey traced the Roman road to NT41861443 on the north approach to a crossing of the Howcleuch Burn. From that point south-south-west for 100 m there runs an impressive embanked way, 9.0 m wide between side ditches 3.0 to 4.0 m wide, and 0.7 m deep. The latter are probably cart-way hollows. The hollow to the west side has been re-cut as a ditch. At NT41831433 the embanked way with its side-works narrows and evolves over some 20 m into a single 3.5 m wide cart-way within a 6.0 m wide cutting, 0.8 m deep. A dry-stone field-wall running east to west across the cutting is gapped to pass the cart-way. The cutting and cart-way continue south-south-west for 50 m to the edge of the Howcleuch mill-pond at NT41801425. Immediately to the west a major drainage-ditch runs

into the pond from the north-west. Some 50 m away, south-south-west directly across the mill-pond, a similar broad road cutting emerges from the water.

At NT41861427 the 19th century mill-dam, a concrete-faced earth embankment, rises some 3.0 m above the natural burn level in the cleuch. The spillway is to the northern end of the dam, and the disused sluice gate and broken mill-lade to the southern end. The dam formerly powered a sawmill. A final feature at the mill-pond is, at NT41851426, a cart-way hollow, 0.5 m deep and 2.0 m wide at its base, opening to 6.0 m wide between side-bank crests, which runs in from the north-north-east, 40 m east of and parallel to the Roman road complex. Its counter-part on the opposite side of the mill-pond is clearly a cart-way towards Greenbank farm.

The road cutting, 5.5 m wide, emerging from the mill-pond at NT41811422, almost immediately divides into two hollowed ways, both 2.7 m wide, one to each side of an embankment, 5.5 m wide and 0.5 m high, and crested with a line of mature trees. These features are in obvious continuation of the complex of mounded and hollowed ways north of the mill-pond and are to be interpreted as the Roman road agger and attendant later cart-ways. A short distance to the west a broad ditch, only some 20 m long, runs into the pond from the south-west. The purpose of this ditch, and its counterpart north of the mill-pond, in relation to the drowned road-system is obscure.

The road-mound and its side hollows run some 100 m south-south-west through woodland to NT41791418, where the complex curves to a south-west course and the mound becomes a robust field boundary, 5.4 m wide, with a dry-stone facing on its north-west side some 1.5 m high. The mound is still backed on its south-west side by a cart-way hollow 3.6 m wide. Forward of the wall, a low terrace protrudes north-west some 5.0 m into the rough pasture. This adaptation of the Roman road-mound as a field boundary runs to the B711 tarmac road at NT41691406. By comparison, the south-east boundary of the woodland is a standard stone-faced ha-ha of modest build. Just short of the tarmac road a minor turf bank, probably a droving aid, crosses north to south towards an access gate to the B711. South-west from this point the Roman road almost certainly follows the well-metalled field-road bordering woodland for 500 m south-west to NT41311374, but except for this road-surface no feature possibly attributable to a Roman road is evident on or near the line.

A prominent circular mound 22 m in diameter lies in Borthwickbrae land at NT41531393 some 20 m south-east of the road-line. The mound is on a local ridge crest and is in line-of-sight with Craik Cross Hill summit and Roman signal

station, 14 km to the south-west. The mound is also in line-of-sight of Eildon Hill North summit, NT554328, 18.5 km to the north-north-east, and the well-known Roman signal station there. This latter line-of-sight finding, not noted on the ground for reasons now disremembered, emerged from a desk study of sheets 79 and 73 of the 2.0 cm Ordnance Survey conjoined. The feature cannot immediately be accepted as a Roman signal station base (Lonie, 1996b).

At these distances the human eye, unaided by telescope, cannot detect the presence or absence of a skyline object smaller than about 3.0 m across. Normal semaphore arms would be quite invisible, and the signal tower itself, say 9.0 m tall and 4.0 m wide, would be but a speck on the horizon. A large smoke-signal by day or a bright beacon-fire by night would be visible at the distances involved. Appendix A gives the calculations for inter-visibility allowing for Earth curvature.

The line-of-sight findings do not resolve the problem of the identity of the Borthwickbrae cairn. Immediately adjacent to Eildon Hill North, with its Bronze Age ritual enclosure and Roman signal station (Owen, 1987), is Eildon Mid Hill, its 404 m summit bearing a Bronze Age cairn, and its sanctity marked by ritual offerings of Bronze Age socketed axes at its foot (Wilson and Wilson, 1982; O'Connor and Cowie, 1987). A tribal chief may well be laid to rest on Borthwickbrae in sight of the sacred Eildon Hills, for sacred they certainly were. The line-of-sight was extended beyond the Eildons to see if they were over-topped by any hills beyond which might obscure signalling. A surprise finding was that exactly on-line, 43.2 km north-north-east from Borthwickbrae, is Dirrington Great law, on whose summit are two fine Bronze Age cairns..

Roman roads are best authenticated by the discovery on them of Roman sites. The Greenbank farm infield of some four hectares about NT419141 meets all the site requirements of a Roman fort, but shows no appropriate traces either on the ground or on air photographs. The distance from Raeburnfoot Roman fort by Craik Cross Hill is 23 km, (14 miles, 3.0 furlongs); from Dere Street is also 23 km, near standard inter-fort distance in the North British military zone. The pattern of Roman forts in the Tweed basin suggests several to be missing.

From the Borthwickbrae mound, for 700 m south-west on the projected line over improved pasture and through woodland strips, no certain trace of the Roman road could be found. The field and woodland boundary line bends south-south-west and, though marked in places by an earth bank slumped to 3.0 m wide and 0.3 m high, as about NT41061336, projects to a very unconvincing approach to and crossing-point of the Borthwickbrae Burn. Search of the burn banks and

approaches upstream of Burnfoot farm (Lonie, 1995) brought resolution of the problem.

**(7) Borthwickbrae, Burnfoot and Milsington
NT413137 to NT406130. Figure 1(a).**

The Roman road traced to NT41311374 on the north-west edge of Borthwickbrae park (Lonie, 1996b) is lost for some 700 m about the projected line south-west. Survey from Burnfoot farm located the Roman crossing of the Borthwickbrae Burn and the approaches to it. These lie on the projected road-line.

From the field-gate of Kelloe Plantation at NT40841323, level pasture for 40 m south-west leads to a broad linear mound which develops into a low mounded terrace 6.8 m wide. This terrace runs diagonally down-slope to an obvious crossing of the Borthwickbrae Burn at NT34621301. At this point a small tributary runs in from the north. A well-built dry-stone wall runs centrally on the upper length of the terrace, a slumped turf dyke on the lower. This terrace-way and burn crossing-point lie almost exactly on the general Roman road-line projected from the north-east.

The crossing and its Roman nature are evidenced by an eroded length of road-mound in the burn-bed, cut through by the burn and its tributary separately to reveal the remains of a heavy stone bank topped with clay over-grown with grass. Immediately downstream a scatter of large stones confirms the broken structure. Whether the burns were culverted or bridged is not obvious from the remains.

Such a two-stage crossing of a watercourse was typical of Roman practice. So also is the choice of crossing point. Some 10 m downstream, an outcrop rock dyke across the flow, 0.5 m thick, is at the head of a modest cataract, while above it the burn meanders. This feature provides a combination of low gradient approaches and minimum loss of height unique in a kilometre length of the burn. Despite this precise relocation of the Roman road at the burn, no road-like structure could be traced in the 700 m hiatus noted above. There is no barrier to a Roman road on the line. It must be concluded that the road was lightly made on the firm and well-drained terrain of the passage, and subsequently ploughed-out.

Missing lengths from otherwise well-established Roman roads are commonplace, and are generally attributable to frequent ploughing on high-quality agricultural land. Structural traces of Roman Dere Street are 'missing' for most of the 25 km length from St. Boswells to Channelkirk through the fertile lands of

Tweeddale and Lauderdale. Again, the Devil's Causeway Roman road through the fertile plain of Northumberland is very fragmentary on lower ground.

The roadway continues on line south-west from the crossing as a sharply defined mounded terrace, 5.1 m wide backed by a 2.0 m wide ditch, which rises on the north-west side-slope of a broad gully. At the foot of the terrace, erosion reveals that the road-mound of clay and small stones is set directly on the clay subsoil, without road-bed or kerbs. The north-west forward edge of the terrace, though fully grassed over, seems unduly sharply scarped, probably from the upcast of a relatively recent recut of the ditch and from fence-work along the terrace length. At the head of the terrace at NT40581295 the mound fades, but apparently curves to the south-east with the fence to run into the woodland strip and farm-road leading to Milsington. A more Roman line directly over Milsington Hill could not be imposed on visible structures. It is hoped to continue the survey.

Appendix

Earth Curvature and Line of Sight

Surface Lowering with Distance

Because of the curvature of the Earth's surface, distant flat land or, more obviously, calm sea, droops below eye level and finally disappears beyond the horizon. Objects beyond this horizon, such as mountains or ships, are partially or totally concealed. Mountains on the skyline are lowered or disappear entirely, while ships at a suitable distance go 'hull down', with only superstructure or sails showing above the horizon. For a man of middle height with his feet lapped by the sea, eye level is at about 1.63 metres (5ft 4in), from which his sea horizon may be calculated to be 4.6 km (2.8 miles) away.

This lowering of the Earth's surface from eye-level (H , in metres) with increasing distance from the observer (d , in kilometres) is readily calculated from the equation $H = 0.0785d^2$ (see Tables 1 and 2).

From the values given in Table 1 it is evident that up to 2.0 kilometres the lowering is negligible, but that at longer signalling distances, say from 4.0 to 15 kilometres, some regard must be paid to the Earth curvature effect.

In assessing line-of-sight situations, the observer sees, not heights, say in metres, but the angle subtended by the object looked at. The same object 'looks smaller' at a greater distance. A useful measure of such angles is the 'milliradian',

mrads for short. This is the angle subtended by an object one metre in length at a distance of one kilometre, or a 10 m high tower at a distance of 10 km. A thumb's width (c.25 mm) viewed with the arm extended (c.0.57 m) covers $25/0.57 = 44$ mrads. Try this measure against familiar distant objects.

The mrad is very close in angular value to the 'mil' used by artillerymen for altering the fall of shot. The mil is 1/6400 part of a full circle, i.e. 0.05625 degrees, while the mrad is 0.05730 degrees. The OS surveyor's 'mil', at 0.05603 degrees, seems to be slightly different again. The gunnery 'mil' is of 18th century origin. The authors cannot find previous application, or even mention, of the mrad, but it is a perfectly respectable unit of angular measure. The parent unit, the radian, is the angle subtended at the centre of a circle by an arc of the circle equal to its radius. The arc of a circle subtended by an mrad is so short that it may be regarded as a straight line, as in the definition above.

Personal Notes of June 1994 record struggles with line-of-sight and the conclusion that the eye-level of the observer and the plane it defines is the only useful base for angle of elevation and depression measurements. These angles enable line-of-sight between stations in hilly ground to be assessed from OS locations and altitudes along the sightline. The authors suspect the re-invention of plane-table surveying. An example illustrates the method.

For stations Z (observer), A, B and C on the sight line, the distances ZA, ZB and ZC may be measured, conveniently on the 2.0 cm OS map. The altitudes of the stations may also be read off, interpolating between contour lines if necessary. The height of any elevated stance, such as signal towers, is to be added individually to the altitudes of observer and 'target'. The Earth curvature lowering appropriate to the distances from the observer, plus the altitude of station Z, is then subtracted from the altitudes A, B and C, to give height values which may be either positive or negative: positive for heights above the observer's eye level, negative for those below. The final step is to determine the angles of elevation or depression in mrads by dividing these heights, in metres, by their distances from Z, in kilometres. Positive or negative angles may obtain: above or below eye level respectively.

Simple inspection of these angle values will reveal whether or not line-of-sight exists between Z and B not blocked by A, and between Z and C not blocked by either A or B. The mrad angle determination step cannot be omitted, since a lesser height closer to the observer may obscure a greater height farther off.

Table 1**Surface Lowering with Distance**

d = Distance (kilometres)

H = Lowering (metres)

$$(H = 0.0785d^2)$$

d	H
1	0.1
2	0.3
4	1.2
8	5.0
10	7.9
15	17.7
20	31.4
30	70.7
40	125.6
50	196.3
60	282.6

From these values it is evident that up to 2.0 kilometres the lowering is negligible, but that at longer signalling distances, say from 4.0 to 15 kilometres, some regard must be paid to the Earth curvature effect.

Table 2
Line of Sight Calculation

Station Notes	Z	A	B	C	D	E	
Distance d (km)	0	9.00	16.00	21.50	30.00	50.00	1
Altitude a (m)	40	27.50	62.50	65.00	160.00	300.00	2
Curvature H (m)	0	6.36	20.10	36.29	70.65	196.30	3
Z level height a' (m)	0	-18.86	+2.40	-11.29	+49.35	+82.80	4
Elevation angle θ (mrad)	~	-2.10	+0.15	-0.53	+1.65	+0.28	5

1. Distance from observer Z
2. Height above sea level.
3. Sea level fall with distance.
4. Height above/below observer eye level.
5. $\theta = a'/d$.

Line of Sight Calculation

Figure 2 shows a typical land profile along a sight-line from an observer stance (Z) at an altitude of 40 m (132 ft) over irregular rising ground to a summit E of altitude 300 m (990 ft), 50 km (31 miles) distant. Summits or ridge crests A, B, C and D lie between Z and E. On Figure 2 the sea level curve S-S' is plotted from the values of Table 1.

Table 2 shows examples of line-of-sight calculations. Inspection of the elevation angles from Z shows summit A to be overlooked. Summit B is in clear sight, but summit D looms beyond it by 1.50 mrad (1.65-0.15), at 30 km by 50 m, nearly one third its full height. Summit C, though marginally higher than B in altitude (measured from sea level, S-S'), is fully concealed by B. D conceals E, despite the considerably greater altitude of E.

Sea level curve S-S' of Figure 2 has other uses. Sea level, strictly 'Mean Sea Level' is the base for land altitude values, and the surface of the sea follows the Earth curvature exactly. The 'observer sea horizon' marked, crosses the sea level curve at a distance from observer Z of 22.6 km. Note that this sea horizon line is the same value below the observer sea level as the observer eye level is above, so that sea horizon distances for observers at various altitudes can easily be read off the Figure.

Tea clippers of the 19th century towered to over 60 m (196 ft), giving a horizon from the main mast top of some 28 km (17.5 miles). A modest hill of 300 m (990 ft) altitude has its sea horizon 62 km (39 miles) distant. The lookout on the clipper top could therefore sight the hill summit at a distance of 28+62 = 90 km (56 miles). The Pharos of Alexandria and the Colossus of Rhodes, both standing perhaps 100 m tall at port entries, would have been of great importance to eastern Mediterranean coastal navigators of the 3rd century BC. Ptolemy's *Geography of North Britain* of the 2nd century AD has careful high landfall indicators despite its gross distortions.

References

- Chevallier, R. (1976). *Roman Roads*. London.
- Hardie, R.P. (1942). *The Roads of Mediaeval Lauderdale*. Edinburgh.
- Lonie, W. (1989). Roxburgh district. The Street (Morebattle parish); early road, dual. *Discovery and Excavation in Scotland* 1988: 8.

- Lonie, W. (1996a). Ettrick and Lauderdale district. Drove-way Sign-walls (Ettrick parish, Kirkhope parish, Robertson parish and Yarrow parish). *Discovery and Excavation in Scotland 1995*: 5.
- Lonie, W. (1996b). Roxburgh district. Blawearie to Milsington (Robertson parish); Roman road traces. *Discovery and Excavation in Scotland 1995*: 9-10.
- Lonie, W. and Newall, F. (1996a). Ettrick and Lauderdale district. Harelaw to Woo Law (Lilliesleaf parish and Ashkirk parish); Roman road traces. *Discovery and Excavation in Scotland 1995*: 5.
- Lonie, W. and Newall, F. (1996b). Roxburgh district. Woo Burn to Blawearie (Robertson parish); Roman road traces. *Discovery and Excavation in Scotland 1995*: 9.
- Margary, I.D. (1973). *Roman Roads in Britain*. Third edition. London.
- Newall, F. and Lonie, W. (1990). The Romans and Strathclyde: the road system. 1. General description of the roads. *Scottish Naturalist*, 102: 3-25.
- O'Connor, B. and Cowie, T. (1987). A group of bronze socketed axes from Eildon Mid Hill, near Melrose, Roxburghshire. *Proceedings of the Society of Antiquaries of Scotland*, 115: 151-158.
- Owen, O. (1987). Ettrick and Lauderdale district. Eildon Hill North (Melrose parish); hill fort and hut platforms. *Discovery and Excavation in Scotland 1986*: 1-2.
- Richmond, I.A. (1948). A new Roman mountain-road in Dumfriesshire and Roxburghshire. *Proceedings of the Society of Antiquaries of Scotland*, 80/81: 103-117.
- Robertson, A.S. (1962). Excavations at Raeburnfoot, Eskdalemuir, 1959-1960. *Transactions and Proceedings of the Dumfriesshire and Galloway Natural History and Antiquarian Society*, 39(3rd series): 24-49.
- Wilson, W. and Wilson, A. (1982). Metal detector finds on 9th August 1982. Reported in O'Connor and Cowie (1987).

Dr. William Lonie, 11 Dean Place, Newstead,
MELROSE, Roxburghshire TD6 9RL.

Mr. Frank Newall, 6 Cherryhill, Hunter Street,
Kirk, DUNOON, Argyll PA23 8DW.

THE REPTILES AND AMPHIBIANS OF THE CLYDE AREA: A TWENTY-YEAR UPDATE, 1982-2002

By J.A. GIBSON

*South-West Scotland Representative,
Herpetofauna Groups of Britain and Ireland*

Introduction

The purpose of this short paper is to give an update of the status of reptiles and amphibians in the Clyde area, to show what changes have taken place since the publication of the last comprehensive account of Clyde reptiles and amphibians, some twenty years ago (Gibson, 1982) (32). The routine status of reptiles and amphibians in Clyde, as stated in the previous definitive Clyde papers (Gibson, 1976 and 1982), knowledge of which is assumed (24, 32), is therefore not necessarily repeated here, unless for purposes of discussion.

Clearly it is not possible to record all changes, which would be tantamount to rewriting the previous papers, and in general terms the status of most species has remained reasonably stable (13, 24, 28, 32), but some interesting changes have certainly taken place, and a summary of these changes is given in the following notes.

It should be emphasized, however, that Clyde is a complex area, with traditional differences in vertebrate distribution throughout lowland Clyde, highland Clyde, and the Clyde islands (24, 32). Therefore, since over twenty years have passed since the last comprehensive account, it is probably desirable to repeat at least some of the basic background structure, for the benefit of any relative newcomers to the subject who, although interested, may not always be too familiar with the complexities of Clyde, its extensive area and boundaries, and the history of Clyde recording, especially since national surveys have occasionally overlooked some important Clyde published work (72).

The Clyde Area

The natural divisions of Scotland are now extremely well known to all experienced Scottish naturalists. First described by Dr. F. Buchanan White in 1872, they were later slightly modified by Dr. J.A. Harvie-Brown towards the end of the 19th century for his Vertebrate Fauna series, by which time they had become

Table 1**CLYDE FAUNAL AREA****The fifteen Minor Faunal Areas**

Ayr: County of Ayrshire.

Renfrew: County of Renfrewshire.

Lanark: County of Lanarkshire.

Dunbarton: County of Dunbartonshire.

Loch Lomond: Loch Lomond catchment area, including the islands.

West Stirling: The area of Stirlingshire county draining to Clyde.

Cowal: Cowal district of Argyll.

Upper Loch Fyne: The area of Argyll between Loch Fyne and Loch Awe.

Knapdale: Knapdale district of Argyll.

Kintyre: Kintyre peninsula of Argyll.

Arran: Island of Arran, with Holy Island and Pladda.

Bute: Island of Bute, with Inchmarnock.

Cumbrae: Islands of Great and Little Cumbrae.

Ailsa Craig: Ailsa Craig.

Small Islands: All off-shore islands except Buteshire group.

widely known as the 'Faunal Areas' of Scotland, and have formed the basis of all serious vertebrate recording in Scotland ever since.

Being based almost entirely on the main river drainage or other natural areas of Scotland, the boundaries of the faunal areas do not change, unless later research has shown this to be necessary, and as such they will always remain far superior to all other recording areas which could be selected, particularly local government or other artificial areas, which can change at the whim of politicians or civil servants. Further subdivisions, largely on the basis of the traditional counties (which usually also follow fairly clear natural boundaries), individual islands, etc, are available for more detailed recording; these subdivisions are usually referred to as the 'minor faunal areas'.

With regard to the Clyde area, good preliminary attempts were made to establish the accurate boundaries of Clyde for the 1876 British Association meeting in Glasgow, and eventually Clyde was precisely defined for the Glasgow meeting of the British Association in 1901, for which a splendid Handbook, with an accompanying detailed map of the entire Clyde area, was issued. Minor modifications to the drainage area boundaries of the lowland Clyde counties later took place, and by the early 1930s the addition of the western strip of Clyde Argyll, where the drainage boundaries were not always absolutely clear, was generally accepted.

The authoritative definition of Clyde, on which virtually all serious Clyde vertebrate recording has now been based for over a century, is therefore as follows: south of the river Clyde, the lowland counties of Ayrshire, Renfrewshire and Lanarkshire; north of the river Clyde, the county of Dunbartonshire, the Loch Lomond area, and West Stirlingshire; Clyde Argyll - the districts of Cowal, Upper Loch Fyne, Knapdale, and Kintyre; the large Clyde islands of Arran, Bute, and the Cumbraes; the famous bird-rock of Ailsa Craig; and the small Clyde islands. This is a total of fifteen minor faunal areas. For ease of reference, these are set out in Table 1, with a diagram of the Clyde Area plus the 170 10km squares of Clyde in Figures 1 and 2.

Unfortunately, nowadays it seems necessary to re-emphasize this description of the true Clyde area, whereas just over a generation ago it would hardly have been worth mentioning. There is now a growing worry, however, that many younger naturalists (in all disciplines, not just herpetology), who are possibly not quite so well versed in the history of the subject, simply do not know what the term Clyde actually means, and clearly do not understand the real extent of the Clyde boundaries. Much more seriously, however, it is evident that some are also

**Figure 1**

Diagram of the Clyde Faunal Area

completely unaware of the very existence of much of the work, even the published work, which has already been done, which has led to some extremely serious and completely avoidable errors.

Misuse of the term 'Clyde', or even worse 'Clyde Area', when what is really meant is a much smaller part of Clyde, e.g. the old traditional 'Glasgow' district, i.e. inner Clyde, is extremely inaccurate and can lead to considerable confusion. There can be no objection whatever to using 'Clyde' as part of a title to describe some much smaller area, provided one says so clearly in the title and describes the smaller area accurately, but unfortunately this recent tendency to misuse 'Clyde', without any qualification, is increasing. If one is describing some smaller part of Clyde, such as Inner Clyde, Upper Clyde, Greater Glasgow, Clyde Estuary, etc, then simply say so; there are some perfectly suitable and accurate terms available which will not lead to serious mistakes. If Clyde is not what is meant, then this should be clearly stated, and in the interests of accuracy it is very desirable that this unfortunate practice should now cease.

It is therefore hoped that this gentle reminder, from an elderly Clyde naturalist for whom the accuracy of Clyde records is of some importance, will help towards more precise descriptions of any future recording.

The Clyde Reptile and Amphibian Group

The Clyde Reptile and Amphibian Group was founded in 1970. It was established by the Renfrewshire Natural History Society (the oldest natural history society in the West of Scotland, founded in 1847) in conjunction with the Clyde Area Branch of the Scottish Wildlife Trust, with input from all major natural history societies throughout the entire Clyde area, plus other kindred organisations.

The purpose of the Group was to establish as accurately as possible the distribution and status of all reptiles and amphibians throughout the 170 10km squares of the entire complex area of Clyde - the lowland, highland, and island parts - and to sponsor, and assist the publication of, investigations into the status of reptiles and amphibians in all parts of the Clyde area, in particular those areas of Clyde which had not previously had a significant separate account of their herpetofauna published.

Dr. J.A. Gibson, Chairman of the Clyde Area Branch of the Scottish Wildlife Trust, was appointed Chairman of the Group, and the Group's combined activities led to a steady series of regionally important written and Atlas publications, which might not otherwise have seen the light of day. All told, this has made the Clyde

area, as far as herpetofauna is concerned, far and away the best investigated and recorded of any equivalent area anywhere in the country.

The records of the Clyde Group are stored at the Clyde Area Biological Records Centre (headquarters at the Scottish Natural History Library) which has regular exchanges of information with the National Biological Records Centre at Monks Wood. Indeed, the Clyde Group's cumulative records have provided virtually the entire Clyde information for all local and regional Clyde surveys, and made a very significant contribution to the current national Atlas of British reptile and amphibian distribution (Arnold, 1995) (2). The detailed records, giving the known distribution of all Clyde reptiles and amphibians, are recorded on cards for each of the 170 10km squares of Clyde, and if any other naturalists wish to do work on a particular square, Dr. Gibson will be glad to supply details of the information which is already on record.

Clyde Recording

A useful summary of the history of Clyde reptile and amphibian recording from earliest times, showing the steady development of our knowledge, was given in both the 1976 and 1982 comprehensive Clyde papers (24, 32), so it is not necessary to repeat this here, but it worth noting the following:

Any distribution-study of an animal group within the Clyde area is made particularly interesting by the division of the entire area into north and south parts by the river Clyde itself, with the islands to some extent intermediate. These parts show marked differences in distribution, particularly noticeable with the mammals and the birds, but with the exception of the Adder and the Palmate Newt, each of which is much commoner in highland Clyde and on the islands than in lowland Clyde (24, 32), these differences are not nearly so clear-cut amongst the reptiles and amphibians.

For ease of back reference, the pagination from each of the two immediate-past comprehensive accounts of Clyde reptiles and amphibians (Gibson, 1976 and 1982) is given in brackets at the commencement of each species, followed by a summary of the present status with an account of any changes, or a brief note if there has been no significant change. A substantial bibliography of past published work accompanied each of the two previous comprehensive Clyde papers (24, 32).

Two alien species, the Red-eared Terrapin and the Alpine Newt, which are now fairly widespread throughout many parts of the British Isles, following escapes or introductions, are also listed. These are fairly recent incomers to the Clyde area,

so were not included in the previous accounts (24, 32) of Clyde reptiles and amphibians (Gibson, 1976 and 1982).

Systematic List

In the following Systematic List, arrangement and nomenclature follow *Amphibians and Reptiles* (2000) by Trevor Beebee and Richard Griffiths (3).

REPTILES

Sauria (Lizards)

Common Lizard *Lacerta vivipara*

[1976: 55; 1982: 214-215]

The Common (or Viviparous) Lizard was formerly common all over the Clyde mainland (24, 28, 32, 44), throughout the lowland counties (50, 18, 20, 21, 34, 36, 45), around Loch Lomond including several of the islands (53, 10, 52, 12, 64, 33, 48), and throughout Clyde Argyll (6, 46, 47, 26, 30, 49). It was also common on the large Clyde islands of Arran, Bute and Great Cumbrae (56, 14, 16, 22, 27, 29), and on many of the smaller Clyde islands (15, 17, 23, 28). A re-survey of small island distribution during 1998-2000 showed that the Lizard was still the most widely distributed reptile on the small islands, with records from nearly twenty of the Loch Lomond and Clyde sea islands.

Most unfortunately, however, the Lizard, once so well-known and widely distributed throughout the Clyde area (24, 32), has undergone a substantial decrease in population, particularly over the past twenty-odd years. Although still fairly well distributed in most suitable areas, in actual numbers the Lizard population is now very much less (44). Whereas over a generation ago any experienced naturalist could easily see many Lizards in an afternoon's walk, nowadays in many apparently perfectly suitable parts of Clyde there is hardly a Lizard to be seen, and the reasons for this worrying decrease are still not clear (44).

Sand Lizard *Lacerta agilis*

[1976: 55; 1982: 214]

No change; no authentic record.

Slow-Worm *Anguis fragilis*

[1976: 55; 1982: 214]

Slow-Worms had formerly substantially decreased in numbers throughout lowland Clyde (32, 37), and it was suggested that, in some areas at least, this was because of the steady tidying-up of semi-derelict areas as urban growth spread (20, 21, 24, 32, 37). Recently, however, repeat surveys have shown some indication of increase (45), and it is to be hoped that this excellent state of affairs continues.

Fortunately the Slow-Worm remains reasonably common throughout the Loch Lomond area, Clyde Argyll, and on the main Clyde islands (10, 52, 12, 64, 14, 16, 17, 46, 23, 26, 29, 30, 49, 33, 48).

On the famous bird-rock of Ailsa Craig there has been a remarkable change (65, 57). In the course of over fifty years of recording on Ailsa, Dr. Gibson found hardly any specimens measuring more than fourteen inches long (15), but after the extermination of the rats on Ailsa in 1991-92, Dr. Bernard Zonfrillo found some Slow-Worms of remarkable size, with a male specimen on 12th May 2000 "which measured 490 mm - a British record. It weighed 49 gms" (73).

Serpentes (Snakes)

Grass Snake *Natrix natrix*

[1976: 56; 1982: 215]

There is no real evidence that the Grass (or Ringed) Snake has ever been a native species in the Clyde area, and virtually all the occurrences can be traced to escapes (71, 50, 62, 14, 16, 18, 20, 24, 32, 34, 36). Although not apparently nearly so popular as pets nowadays, Grass Snakes are still sold in some local pet shops, so these escapes are likely to continue. There have been several recent Clyde records (e.g. 25, 38).

Adder *Vipera berus*

[1976: 56-57; 1982: 215-217]

The Adder remains very common throughout all districts of Clyde Argyll (51, 54, 6, 26, 30, 49), with the population in Kintyre (54, 59, 6, 46, 47) probably greater than anywhere else in Scotland. It is also common in the Loch Lomond area but has decreased on the Loch Lomond islands, where it was formerly well-known, possibly because of increased woodland (53, 4, 10, 52, 12, 64, 33, 48). On the Clyde islands the Adder remains common on Arran and Holy Island (56, 14, 19, 22), but occurs naturally on no other Clyde island (5, 16, 23, 28, 29).

This is another species which has undergone a very marked decrease in lowland Clyde (24, 32), and in Renfrewshire, compared to fifty years ago, the Adder is now distinctly rare (50, 18, 20, 45), with fairly similar decreases in adjoining parts of Ayrshire (34) and Lanarkshire (36). Some do still occur, however, with isolated local pockets of population, so naturalists should always be on the alert.

Adder bites with genuine envenomation are quite rare in lowland Clyde, but one (the first reported for over five years) had to be treated in Ayr Hospital in August 2001. The bite (on the left arm) was fairly serious, but responded rapidly to treatment with Zagreb antivenom. In this respect, a paper on useful first-aid treatment of Adder bites when one is isolated in the countryside has recently been published (42) and copies can be obtained, free of charge, by contacting Dr. Gibson at the Clyde Area Biological Records Centre, Foremount House, Kilbarchan, Renfrewshire PA10 2EZ (01505-702419).

In the Clyde area nowadays most Adders begin to emerge from hibernation around the end of February or early March, apparently a little later than the average dates further south, but spells of warmer weather can cause Adders to emerge much earlier, and in the Clyde area Adders have certainly been recorded from every month of the year; I myself have seen one active on Christmas Day.

These winter occurrences used to be quite rare and therefore worthy of note (63, 46), but although still relatively uncommon, over the past decade a succession of milder winters has led to many more records of such early appearances. It is assumed, however, that most of these specimens would simply die when there was a later drop in temperature.

Adders swim well, and are regularly recorded from hill-lochs and highland tarns, particularly in Clyde Argyll (51, 4, 54, 60, 55, 12, 46). Records of Adders in salt-water are much less common but some do occur, with records going back over a hundred years, and there have been several recent records from West Loch Tarbert, in north Kintyre, and even from the Kilbrannan Sound, between Kintyre and Arran (61, 46). It is always possible, however, that these creatures had been washed out to sea by rivers in spate or had been picked up and later dropped into the sea by predatory gulls (32).

Smooth Snake *Coronella austriaca*

[1976: 56; 1982: 215]

No change; no authentic record.

Chelonia (Turtles)

Leatherback Turtle *Dermochelys coriacea*

[1976: 57; 1982: 217-218]

The only previously confirmed Clyde records of the Leatherback Turtle (Leathery Turtle, or Luth) were in 1875, 1959, 1961 (9, 11, 14, 46) and 1981 (31), plus other 'possibles' in 1947 and 1968 (1, 68, 69, 70, 32), but since then there have been several additional records of Leatherback Turtles from the Clyde sea area, mainly from Loch Fyne and the Kyles of Bute, in 1983, 1991 and 1999 (35, 39).

There have also been other Clyde sightings, less well authenticated, which are quite possibly genuine. It has been suggested that changes in climatic conditions may account for the increased number of records of what was formerly a very rare creature indeed.

Common Loggerhead Turtle *Caretta caretta*

[1976: 58-59; 1982: 217]

No change; no additional records.

Kemp's Ridley Turtle *Lepidochelys kempi*

[1976: 58; 1982: 219]

No change; no additional records.

Turtle *Species indeterminate*

[1976: 59; 1982: 218]

Over the years, several additional records of unspecified turtles have been reported from the Clyde sea area. These records are almost certainly authentic, for although it is often virtually impossible to make an accurate identification of a turtle seen at sea, there is seldom any doubt that the creature was indeed a turtle. Any additional information will be welcome.

Red-eared Terrapin *Trachemys scripta*

[New species]

Although Red-eared Terrapins, imported from North America, had occasionally been kept as pets in our country, during the 1980s the 'Ninja Turtle' craze amongst children generated an enormous demand. Unfortunately, terrapins were apparently somewhat uninteresting as pets, so children rapidly lost interest, and it is clear that many of the terrapins were simply released into local ponds or lochs to fend for

themselves. Many records of Red-eared Terrapins, mostly dead specimens, have been reported from the West of Scotland, usually from the vicinity of towns, as one would expect (40, 43, 45).

Our weather is not normally warm enough for any terrapin eggs to hatch, so it is unlikely that any breeding will take place in the wild, but Red-eared Terrapins are both long-lived and difficult to catch, so any individuals released could well be around for several years.

AMPHIBIANS

Anurans (Frogs and Toads)

Common Frog *Rana temporaria*

[1976: 61-62; 1982: 221]

Some twenty-five years ago there was genuine evidence of a marked decrease in the Frog population in most parts of the Clyde area (20, 24, 32, 33), in common with many other parts of the country. It was suggested that this was because of the drainage of suitable habitats, which may well have had a bearing in lowland Clyde (20, 32), but by the mid-1980s (37) there were signs of a significant decrease throughout Clyde Argyll and on the Island of Arran (14, 26, 33, 37), so there must have been some other factors to be considered. Fortunately Frogs have now returned in some numbers to most of their traditional haunts (45), which is most welcome.

Frogs had apparently died out completely on the small Clyde island of Inchmarnock by the early 1970s (16, 27), when their limited habitat dried up following several hot summers, but they are now established again after some frog-spawn was recently introduced from the neighbouring island of Bute; an earlier attempt at reintroduction, in 1972, was unsuccessful (27).

Very fortunately, the 'red-leg' virus infection, which has caused such trouble in some parts of the south of England, does not so far appear to have been a problem in the West of Scotland, and it is to be hoped that it remains this way. Variations in the Clyde Frog population have clearly been due to other causes as yet not fully ascertained.

In the Clyde area, at least, Frogs can be more active in cold weather than any of the other amphibians, and can occasionally be seen abroad in mild spells during the winter months; there are even records of them swimming in ponds under the ice.

Common Toad *Bufo bufo*

[1976: 61; 1982: 220]

No significant change; still widely distributed in small numbers in most suitable areas throughout all regions of Clyde (24, 28, 32), including several of the small Clyde and Loch Lomond islands (52, 12, 17, 23, 29, 33). Unlike the Frog, there is no recent evidence that the Toad ever experienced any real change in population.

Natterjack Toad *Bufo calamita*

[1976: 61; 1982: 221]

The so-called history of the Natterjack Toad in the Clyde Area is a very good example of just how difficult it is to correct errors when once they have ever appeared in print. The old doubtful, but unfortunately still repeated, references to the Natterjack Toad in Renfrewshire (71) and on the Island of Arran (67) continue to be revived, despite the previous careful assessment and rejection of the records (56, 50, 66, 14, 20, 24, 32, 45). Dr. Gibson continues to investigate any reports, no matter how vague, just in case one turns out to be genuine, but so far always to no avail. At present, the nearest known colonies of the Natterjack Toad are in Solway.

Edible Frog *Rana esculenta*

[1976: 62; 1982: 222]

No change; no additional records.

Urodeles (Newts)**Smooth Newt** *Triturus vulgaris*

[1976: 60; 1982: 219-220]

Loss of habitat because of pollution and drainage of ponds has certainly led to a diminution of the population of newts throughout lowland Clyde (32), although the Smooth Newt, by far our commonest newt species, still remains reasonably common and well distributed (45).

Elsewhere in the Clyde area the Smooth Newt was never very common, being largely replaced by the Palmate Newt in highland Clyde (46, 26, 32, 49, 33), where the Smooth Newt has undergone a significant decrease over the past twenty-odd years and is now distinctly rare. There are still some around the south part of the Loch Lomond area and on the Island of Bute, but I know of no records from the Island of Arran nor from Clyde Argyll for the past ten years.

Palmate Newt *Triturus helveticus*

[1976: 60-61; 1982: 220]

Although primarily a montane species, in some parts of the lowland Clyde counties the Palmate Newt was formerly nearly as well known as the Smooth Newt (50, 8, 20, 24, 32, 33, 34, 36). It was always rather local, however, and over the past decade has become even more restricted in distribution, and reduced in population. This follows the general trend in the reduction of all newt species throughout lowland Clyde (45).

In highland Clyde, around Loch Lomond, on the large Clyde islands of Arran, Bute and Cumbrae, and on several of the small Clyde islands, the Palmate Newt still remains reasonably common and well distributed (56, 53, 7, 8, 52, 12, 14, 15, 16, 17, 47, 23, 49, 33, 48).

Great Crested Newt *Triturus cristatus*

[1976: 59-60; 1982: 219]

It is sad to record that we have now apparently completely lost the Crested Newt from the entire western area of Clyde (24, 32). Despite repeated searches, there have been no positive records from western Clyde since the publication of the comprehensive Crested Newt report (41), so to the best of our knowledge the Crested Newt must continue to be regarded as extinct in all parts of the Clyde area apart from its north-eastern borders, i.e. some localised areas of Dunbartonshire, the south part of Loch Lomond, and West Stirlingshire (52, 58, 33, 48). Fortunately some well-established colonies still survive at traditional sites in these areas, and several additional sites have been discovered within recent years, so the position, at least in this area of Clyde, is encouraging.

The recently discovered colony of Crested Newts at the old steelworks at Gartcosh, north Lanarkshire, however, found in July 1998, continues to thrive. This was a totally unexpected discovery, and gives hope that other hitherto undiscovered colonies may exist elsewhere in lowland Clyde (41).

Alpine Newt *Triturus alpestris*

[New species]

Presumably because of their striking and attractive appearance, within recent years Alpine Newts, a common European species, have become fairly popular as pets, usually introduced as inhabitants of garden ponds. They are regularly sold by many pet shops, and have been introduced to many places throughout the Clyde area (43, 45), but although breeding populations have become established at

several places in England, to the best of my knowledge as yet there is no positive evidence that breeding has ever taken place in Clyde.

There may be one possible breeding record. In the mid-1980s a report was received that a breeding colony of Alpine Newts had been established in a pond on an estate in Cowal, Argyll, but in the course of two later visits no evidence of Alpine Newts was found, and recently the pond was seen to be virtually dry and overgrown. At present, to the best of my knowledge, there is no real indication that Alpine Newts have ever bred in natural conditions anywhere in the Clyde area, but any additional information will be welcome.

Other Species

The Clyde area formerly contained several thriving sea-ports, and over the years many exotic species were accidentally imported. These usually achieved some local publicity at the time, and were eventually deposited in a neighbouring zoo or museum.

Any sea-trade at Clyde ports is now greatly diminished, but on the other hand some people now appear to have the desire to keep foreign reptiles and amphibians as pets. These occasionally escape, and again sometimes achieve local publicity until they are reclaimed by their owners. The two species most commonly found nowadays are the Garter Snake *Thamnophis sirtalis* and the Bullfrog *Rana catesbeiana*, but escaped exotic species do not really concern us here.

Summary

It is believed that this short update includes all significant changes which have taken place during the past twenty years since the publication of the last separate comprehensive account of Clyde reptiles and amphibians (Gibson, 1982), and so brings our knowledge of Clyde reptile and amphibian distribution and status up-to-date, but if any other naturalists can provide any additional information it will be appreciated if they will forward this to Dr. Gibson as soon as possible.

References

1. Anon. (1947). Turtle in the Clyde. *Fishing News*, 23rd August 1947: 8.
2. Arnold, H.R. (1995). *Atlas of Amphibians and Reptiles in Britain*. I.T.E. Research Publication, No. 10. Biological Records Centre, Huntingdon. London: H.M.S.O.
3. Beebee, T.J.C. and Griffiths, R.A. (2000). *Amphibians and Reptiles. A Natural History of the British Herpetofauna*. New Naturalist series No. 87. London: Harper Collins.

4. Bidie, G. (1902). Notes on the Scottish Adder. *Annals of Scottish Natural History*, 1902: 217-220.
5. Blain, J. (c.1820). *History of Bute*. Not published until 1880, when full text edited by W. Ross, Rothesay: W.C. Harvey.
6. Colville, D. (1954). *Notes on the Natural History of the Parish of Campbeltown*. Campbeltown: Kintyre Antiquarian Society.
7. Evans, W. (1921). The Palmated Newt in Argyllshire. *Scottish Naturalist*, 1921: 21.
8. Gibson, J.A. (1946). The Palmate Newt in the West of Scotland. *Transactions of the Paisley Naturalists' Society*, 5: 63-64.
9. Gibson, J.A. (1950). Records of Turtles in Clyde waters and other parts of the West of Scotland. *Transactions of the Paisley Naturalists' Society*, 5: 84-85.
10. Gibson, J.A. (1951). Reptiles on the Clyde and Loch Lomond islands. *Transactions of the Paisley Naturalists' Society*, 5: 95-96.
11. Gibson, J.A. (1960). Further records of Clyde Turtles. *Transactions of the Paisley Naturalists' Society*, 6: 53-54.
12. Gibson, J.A. (1960) Reptiles and amphibians on the Loch Lomond islands. *Transactions of the Paisley Naturalists' Society*, 6: 73-75.
13. Gibson, J.A. (1967 and 1980). Reptiles and amphibians. In: *A List of Clyde Vertebrates*. Paisley: Renfrewshire Natural History Society. Second edition, 1980. Glasgow: Clyde Area Branch, Scottish Wildlife Trust.
14. Gibson, J.A. (1969). The reptiles and amphibians of the Island of Arran. *Transactions of the Buteshire Natural History Society*, 17: 69-72.
15. Gibson, J.A. (1969). The mammals, reptiles and amphibians of Ailsa Craig. *Transactions of the Buteshire Natural History Society*, 17: 73-76.
16. Gibson, J.A. (1970). The reptiles and amphibians of the Island of Bute. *Transactions of the Buteshire Natural History Society*, 18: 31-32.
17. Gibson, J.A. (1970). The reptiles and amphibians of Sanda, Sheep Island and Glunimore. *Transactions of the Buteshire Natural History Society*, 18: 48-50.
18. Gibson, J.A. (1970 and 1983). *An Atlas of Renfrewshire Vertebrates*. Second edition, 1983. Paisley: Renfrewshire Natural History Society.
19. Gibson, J.A. (1972). Increase of Adders on Holy Island, Arran. *Western Naturalist*, 1: 115-116.
20. Gibson, J.A. (1973). The reptiles and amphibians of Renfrewshire. *Western Naturalist*, 2: 4-14.
21. Gibson, J.A. (1975). Summary notes on the vertebrate fauna of Loch Libo and neighbourhood. *Western Naturalist*, 4: 65-70.
22. Gibson, J.A. (1975). *An Atlas of Arran Vertebrates*. Brodick: Arran Nature Centre.

23. Gibson, J.A. (1976). The reptiles and amphibians of the Cumbraes and some other Clyde islands. *Transactions of the Buteshire Natural History Society*, 20: 68-70.
24. Gibson, J.A. (1976). The reptiles and amphibians of the Clyde area. *Western Naturalist*, 5: 53-66.
25. Gibson, J.A. (1976). Grass Snake breeding in the Clyde area. *Western Naturalist*, 5: 113-114.
26. Gibson, J.A. (1977). Notes on the lower vertebrates of Cowal, Argyll. *Western Naturalist*, 6: 35-43.
27. Gibson, J.A. (1980). Recent notes on the lower vertebrates of the Island of Bute. *Transactions of the Buteshire Natural History Society*, 21: 97-98.
28. Gibson, J.A. (1980). *A Regional Check-List of Clyde Reptiles and Amphibians*. Glasgow: Clyde Area Branch, Scottish Wildlife Trust. (Contains separate reptile and amphibian check-lists for each of the fifteen minor faunal areas of Clyde).
29. Gibson, J.A. (1980). *An Atlas of Bute and Cumbrae Vertebrates*. Rothesay: Buteshire Natural History Society.
30. Gibson, J.A. (1980). *An Atlas of Cowal Vertebrates*. Glasgow: Clyde Area Branch, Scottish Wildlife Trust.
31. Gibson, J.A. (1981). Leathery Turtle in Firth of Clyde. *Western Naturalist*, 10: 24.
32. Gibson, J.A. (1982). The freshwater and terrestrial fauna of the Clyde sea area. Part V: Reptiles and amphibians of the Clyde faunal area. *Glasgow Naturalist*, 20: 211-227.
33. Gibson, J.A. (1984). The reptiles and amphibians of Dunbartonshire. *West Dunbartonshire Naturalist Report*, 6: 35-40.
34. Gibson, J.A. (1984). *An Atlas of Ayrshire Vertebrates*. Kilmarnock: Ayrshire Biological Records Centre.
35. Gibson, J.A. (1985). Another Leathery Turtle in the Clyde area. *Scottish Naturalist*, 97: 83.
36. Gibson, J.A. (1985). *An Atlas of Lanarkshire Vertebrates*. Glasgow: Clyde Area Branch, Scottish Wildlife Trust.
37. Gibson, J.A. (1986). Recent changes in the status of some Clyde vertebrates. *Proceedings of the Royal Society of Edinburgh*, 90B: 451-467.
38. Gibson, J.A. (1989). Grass Snake at Kilbarchan, Renfrewshire. *Scottish Naturalist*, 101: 102.
39. Gibson, J.A. (1990). The Leathery Turtle in Buteshire waters. *Transactions of the Buteshire Natural History Society*, 23: 53-56.

40. Gibson, J.A. (1995). Terrapins in the West of Scotland. *Scottish Naturalist*, 107: 167-169.
41. Gibson, J.A. (1998). *The Crested Newt in the West of Scotland. A Re-Survey of Known Sites carried out during 1996-1998*. Kilbarchan: Clyde Area Biological Records Centre.
42. Gibson, J.A. (2000). What to do for an Adder bite. *Scottish Naturalist*, 112: 55-70.
43. Gibson, J.A. (2000). *The Red-eared Terrapin and Alpine Newt: Two Alien Species in Renfrewshire*. Kilbarchan: Clyde Area Biological Records Centre.
44. Gibson, J.A. (2002). The status of the Common Lizard (*Zootoca vivipara*) in the West of Scotland. *Herpetological Bulletin*, 82: 4.
45. Gibson, J.A. (2003). Reptiles and amphibians in Renfrewshire, 1983-2003. *Renfrewshire Natural History Society Newsletter*, June 2003: 4-12.
46. Gibson, J.A. and Colville, D. (1972). The reptiles and amphibians of Kintyre. *Western Naturalist*, 1: 36-41.
47. Gibson, J.A. and Colville, D. (1975). *An Atlas of Kintyre Vertebrates*. Campbeltown: Kintyre Antiquarian and Natural History Society.
48. Gibson, J.A. and Mitchell, J. (1986). *An Atlas of Loch Lomond Vertebrates*. Glasgow: Clyde Area Branch, Scottish Wildlife Trust.
49. Gibson, J.A. and Rainier, I. (1983). *An Atlas of Mid-Argyll Vertebrates*. Lochgilphead: Natural History and Antiquarian Society of Mid-Argyll.
50. Hall, C.A. (1915). Renfrewshire amphibians and reptiles. *Transactions of the Paisley Naturalists' Society*, 2: 66-68.
51. Hinxman, L.W. (1902). Notes on the Common Adder in the Highlands. *Annals of Scottish Natural History*, 1902: 151-153.
52. Hunter, W.R., Slack, H.D. and Hunter, M.R. (1959). The lower vertebrates of the Loch Lomond district. *Glasgow Naturalist*: 18: 84-90.
53. Lumsden, J. and Brown, A. (1895). *A Guide to the Natural History of Loch Lomond and Neighbourhood*. Glasgow: Blackie.
54. Macintyre, D. (1924). The Adder in Argyllshire. *Chambers' Journal*, August 1924: 516-519.
55. Macintyre, D. (1936 and 1950). *Wildlife of the Highlands*. London: Philip Allan. Second edition, 1950. London: Batchworth Press.
56. McNaughton, A. and Macbride, A. (1840). Zoological notes. In: Island of Arran. Parish of Kilbride, and Parish of Kilmorie. *New Statistical Account of Scotland*, 27: 11-14, 43, 46-48. (Reissued 1841, Buteshire; and 1845, Ayr-Bute volume).
57. McWilliam, J.M. (1925). Slow-Worm on Ailsa Craig. *Scottish Naturalist*, 1925: 159.

58. Maitland, P.S. (1966). The fauna of the River Endrick. *Studies on Loch Lomond*, 2: 1-194. Glasgow: University of Glasgow (Blackie).
59. Morrison, N. (1924). *The Life-Story of the Adder*. Paisley: Alexander Gardner.
60. Morrison, N. (1928 and 1937). An angler's unexpected catch. *Field*, 27th September 1928. Also see *Scotsman*, 5th June 1937.
61. Morrison, N. (1929). Sea-swimming Adders. *Scotsman*, 7th December 1929.
62. Morrison, N. (1932). Grass Snakes in Kintyre: interesting experiment. *Campbeltown Courier*, 24th September and 8th October 1932.
63. Morrison, N. (1939). Adder in winter in Kintyre. *Scotsman*, 21st January 1939.
64. Palmar, C.E. (1973). Amphibians and reptiles. In: *Queen Elizabeth Forest Park* (Ed. H.L. Edlin), pp. 40-41. Forestry Commission Guide. Edinburgh: H.M.S.O.
65. Smith, J., Paterson, J. and Watt, H.B. (1900). The natural history of Ailsa Craig. *Annals of the Andersonian Naturalists' Society*, 2: 135-154.
66. Smith, M.A. (1964). *The British Amphibians and Reptiles*. Third edition. New Naturalist series No. 20. London: Collins.
67. Stephen, A.C. (1949). Scottish reptiles and amphibians. *Scottish Naturalist*, 1949: 116-117.
68. Stephen, A.C. (1953). Scottish Turtle records previous to 1953. *Scottish Naturalist*, 1953: 108-114.
69. Stephen, A.C. (1961). Scottish Turtle records 1954-1960. *Scottish Naturalist*, 1961: 43-47.
70. Stephen, A.C., Rae, B.B. and Lamont, J.M. (1963). Scottish Turtle records 1960-61. *Scottish Naturalist*, 1963: 37-38.
71. Taylor, J.M.B. (1900). Common or Ringed Snake in Renfrewshire. *Annals of Scottish Natural History*, 1900: 185.
72. Taylor, R.H.H. (1948 and 1963). The distribution of reptiles and amphibians in the British Isles. *British Journal of Herpetology*, 1: 1-38. Revised survey: *British Journal of Herpetology*, 3: 95-115.
73. Zonfrillo, B. (2000). Large Slow Worm *Anguis fragilis* from Ailsa Craig, Ayrshire. *Glasgow Naturalist*, 23: 59.

Dr. J.A. Gibson,
Chairman, Clyde Reptile and Amphibian Group,
Scottish Natural History Library, Foremount House, KILBARCHAN,
Renfrewshire PA10 2EZ.

THE SCOTTISH NATURALIST

Founded 1871

A Journal of Scottish Natural History

With which is incorporated *The Annals of Scottish Natural History*
and *The Western Naturalist*

Record of Publication

**The Scottish Naturalist and Journal of the Perthshire
Society of Natural Science**
1871

The Scottish Naturalist
1872-1891

The Annals of Scottish Natural History
1892-1911

The Scottish Naturalist
1912-1939, 1948-1957, 1961-1964

The Western Naturalist
1972-1982

The Scottish Naturalist
1983-date

Published by The Scottish Natural History Library

THE SCOTTISH NATURALIST

Founded 1871

A Journal of Scottish Natural History

With which is incorporated *The Annals of Scottish Natural History*
and *The Western Naturalist*

115th Year

2003

CONTENTS

2003 - Part 2

Craik Cross Roman Road North-East of Hoscote

By Dr. William Lonie and Mr. Frank Newall

65-91

The Reptiles and Amphibians of the Clyde Area:

A Twenty-Year Update, 1982-2002

By Dr. J.A. Gibson

93-111

Published by The Scottish Natural History Library
